

Claims

1. Measuring device for determining the concentration of gases by infrared absorption with a modulable radiation source, which, together with two radiation detectors that are located in the beam path, one of which is connected as a measuring detector and the other as a reference detector, is located in the interior of a housing, which is sealed, gastight with respect to the gas to be measured, wherein at least one infrared-permeable window, which closes off the interior of the housing with respect to the gas to be measured is located in the beam path between the radiation source and the radiation detectors, characterized in that the beam path is split into at least three partial sections (21, 22, 23), of which the first section (21) is located between the radiation source (2) and a first infrared-permeable window (3), that the second section (22) is formed as the measurement section accessible to the gas and extends from the first infrared-permeable window (3) to a second infrared-permeable window (4), and that the third section (23) is located between the second infrared-permeable window (4) and the radiation detectors, wherein the housing (11) has dimensional stability with respect to temperatures up to at least 100°C.
2. Measuring device for determining the concentration of gases by infrared absorption in an incubator with a radiation source and two radiation detectors found in the beam path, one of which is a measuring detector and the other a reference detector, and with a housing (11), which is sealed gastight with respect to the gas to be measured, characterized in that a measuring cuvette (1) with a heating device (17) for the heating of a measuring chamber is provided.
3. Measuring device according to Claims 1 or 2, characterized in that at least one beam splitter is located in the beam path of the radiation source (2).
4. Measuring device according to Claims 1, 2, or 3, characterized in that the measuring section (22) is located in a measuring cuvette, whose dimensional stability with respect to heat extends up to a temperature of at least 100°C and which seals off the housing (11) with respect to the outside.
5. Measuring device according to Claim 4, characterized in that the windows (3, 4), which are located in the beam path of the measuring section (22), are made of calcium fluoride.

6. Measuring device according to one of Claims 1 to 5, characterized in that aluminum or brass is used as the material of the cuvette (1) outside the windows.
7. Measuring device according to one of Claims 1 to 6, characterized in that a first and a third partial section (21, 23) of the beam path are located in interior spaces of the housing (11), which are themselves sealed.
8. Measuring device according to one of Claims 1 to 7, characterized in that at least one absorption agent for carbon dioxide is found in the sealed interior of the housing (11).
9. Measuring device according to one of Claims 1 to 8, characterized in that the ratio of the length of the measuring section (22) to the length of the partial sections (21, 23) of the beam path, which passes through the interior of the housing, is in the range of 1:4 to 1:10.
10. Measuring device according to one of Claims 1 to 9, characterized in that a single radiation source (2) is provided, which has a reflector (27) on the side turned away from the measurement.
11. Measuring device according to one of Claims 1 to 10, characterized in that the radiation detectors, together with the beam splitter, are located in a detector module (31), which seals off the interior of the housing (11) and which is connected to the housing in a detachable manner.
12. Measuring device according to one of Claims 1 to 11, characterized in that the radiation source (2) is located in a submodule made of aluminum, which seals off the interior of the housing and which has a recess in the form of an ellipsoid for the formation of a reflector (27).